U.S. Army Research Laboratory
Survivability/Lethality Analysis
Directorate

Survivability Analysis In Support of the Army's Transformation Campaign Plan

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MANPRINT Symposium
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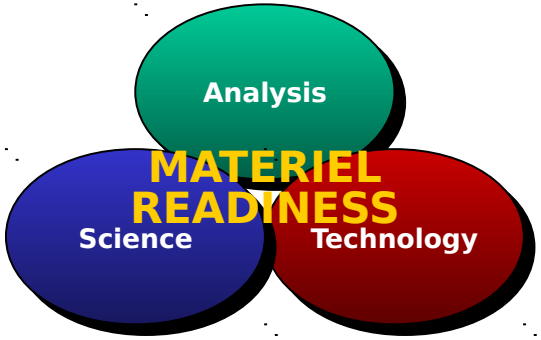


One Thing Is Certain

Information Warfare

Conventional Ballistics

Electronic Warfare

Nuclear

Chem/Bio

Our adversaries will try to attack our most vulnerable points while preventing us from exploiting theirs.

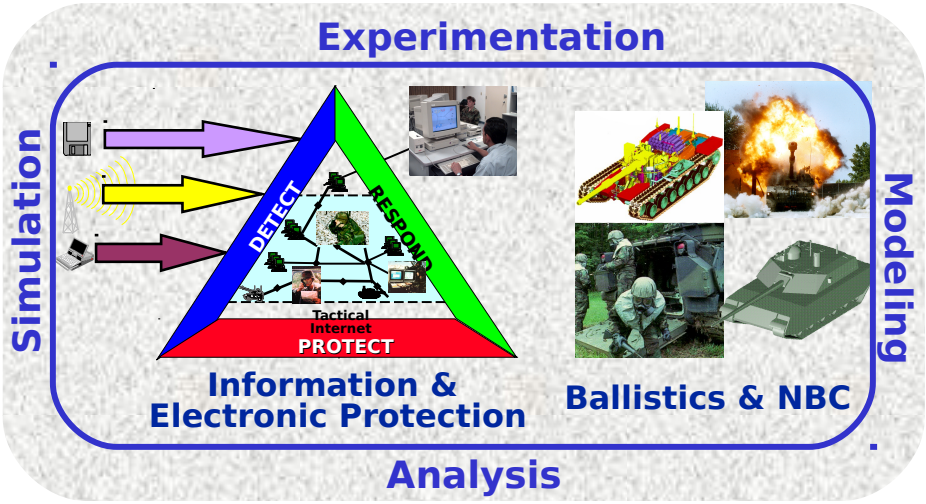
To ensure the survivability and effectiveness of the transformed Army, we must have the best technical understanding of vulnerabilities to all threats.

E^3

Mission & Major Functions

Mission

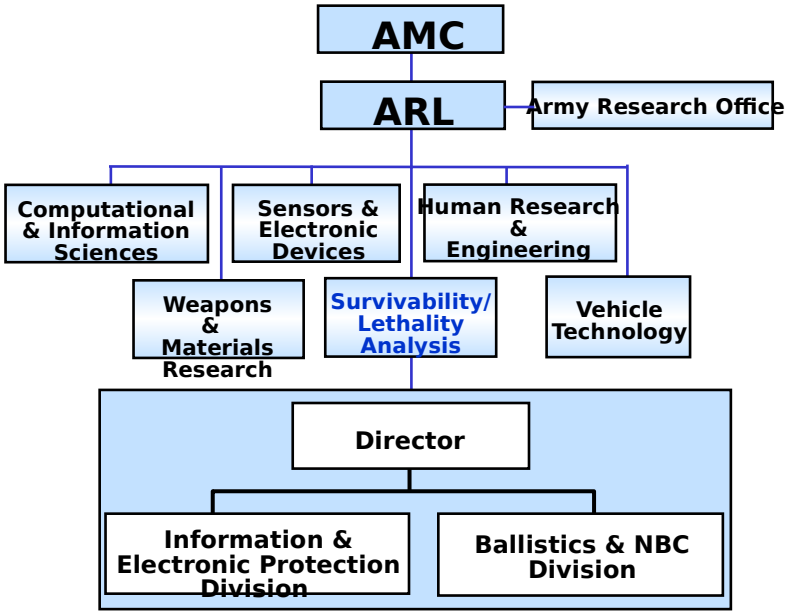
Provide objective survivability, lethality and vulnerability (SLV) analysis and evaluation support over the entire life cycle of major Army systems; and help acquire systems that will survive and be lethal in all environments against the full spectrum of battlefield threats.

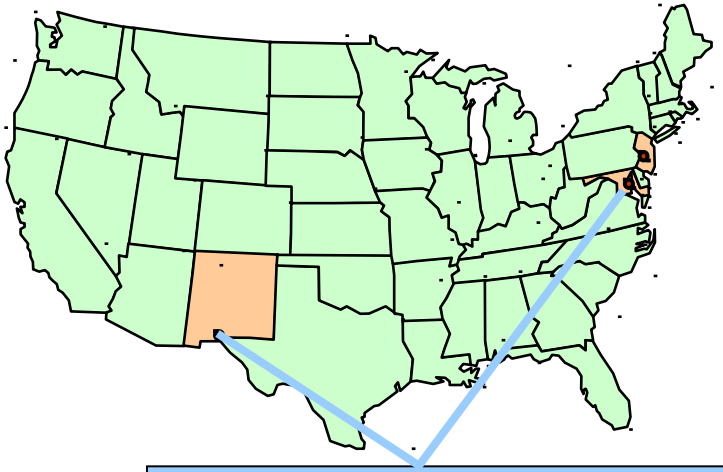


Major Functions

- Provide advice/consultation on SLV issues to HQDA, PEOs/PMs, AEC, combat developers, battle labs, intelligence, and other activities.
- Provide the Soldier Survivability portion of MANPRINTfor integration by HRED.
- Perform special studies and make recommendations regarding tactics, techniques or design modifications.
- Provide technical judgments on complex SLV issues.
- Conduct investigations, experiments, simulations and analyses.

Organization, Locations, and Areas of Focus





Locations
Aberdeen Proving Ground, MD
Fort Monmouth, NJ
White Sands Missile Range, NM

Information Operations
- Command & Control (C2) Protect
- Information Countermeasures

Electronic Protection
- Electronic Countermeasures/ Electronic Counter-counter measures (ECM/ECCM)
- Electronic Warfare (EW) Signature Analysis
- Electromagnetic Environmental

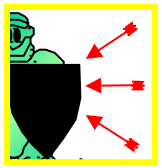
Conventional Ballistics
- Ballistic lethality/survivability
- Individual/Crew Protection
- Live Fire Shot Predictions
- System & Component Functionality
- Soldier Capability/Survivability

Nuclear, Biological, Chemical (NBC)
- NBC Contamination Survivability
- Nuclear Weapons Effects

SLAD's support is based on a solid technical foundation of physics, signal processing, engineering, theoretical analysis, modeling & simulation, and experimentation.

Soldier Survivability
Seventh Domain of MANPRINT

Components



ARL-SLAD

- Reduce Fratricide
- Reduce Detectability of the Soldie
- Reduce Probability of Being Attac
- Prevent Damage
- Minimize Injury

ARL-HRED

- Reduce Physical and Mental Fatig

SLAD Helps Army Answer Critical Questions Based on Scientific & Technical Analysis

Survivable & Lethal Soldiers and Systems

How will the Objective Force survive against ballistic threats?

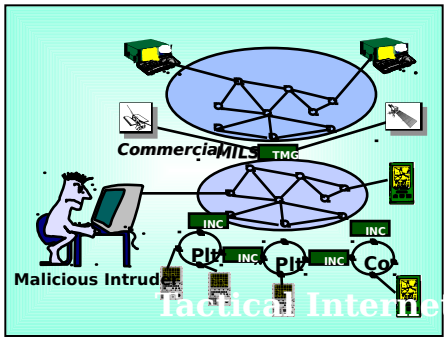
- New system of systems will not depend on traditional passive survivability.
- Quantify non-traditional survivability technologies.
- Analyze performance of sensors in detecting and recognizing incoming threats.

How will the Objective Force survive in an NBC environment?

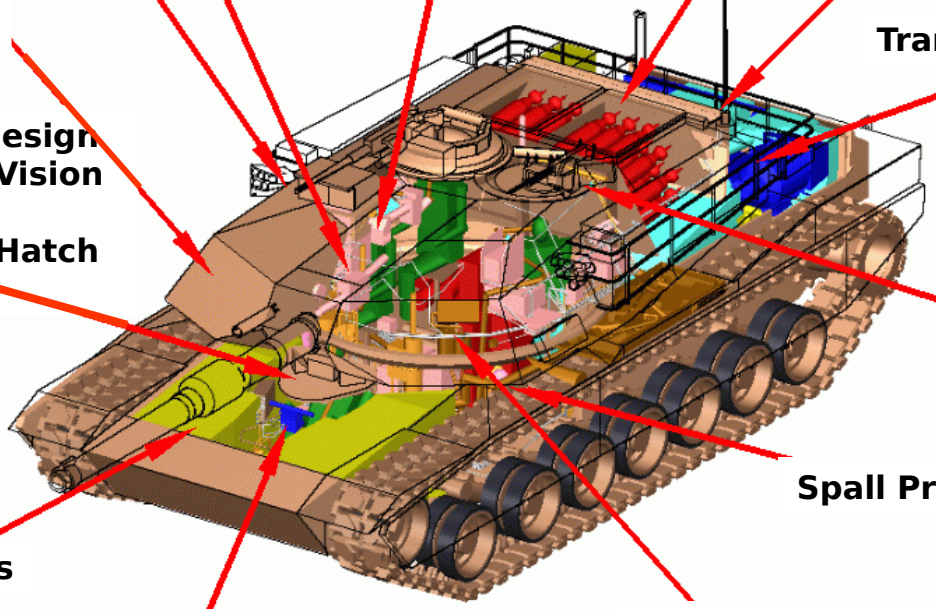
- The Objective Force will operate in small-scale contingency operations (SSC), stability and support operations (SASO), and urban and complex terrain where NBC environment and weapons of mass destruction may be prevalent.
- Determine vulnerability of soldiers and systems to the evolving NBC threat and recommend mitigating solutions.

How will the Objective Force survive against electronic warfare & information warfare threats?

- Key to survivability of the Objective Force is its ability to function as a synergistic unit, with heavy reliance on real-time Situational Awareness data.
- Conduct Information Operations vulnerability and survivability analyses to determine weaknesses in digital systems.



More Survivable Systems



Spall Protected Wiring Harnesses

Blasting Machine Circuit Redesign

Ammunition Compartment

Modify Pyrotechnics Stowage

Eliminate Anti-Tank Mine Stowage

Armor

Transmission Oil Filter Bypass

Driver's Hatch Redesign
Redesign Driver's Vision Blocks
Redesign Driver's Hatch Mechanism

Loader's Hatch Redesign

Spall Protection for Hydraulic Lines

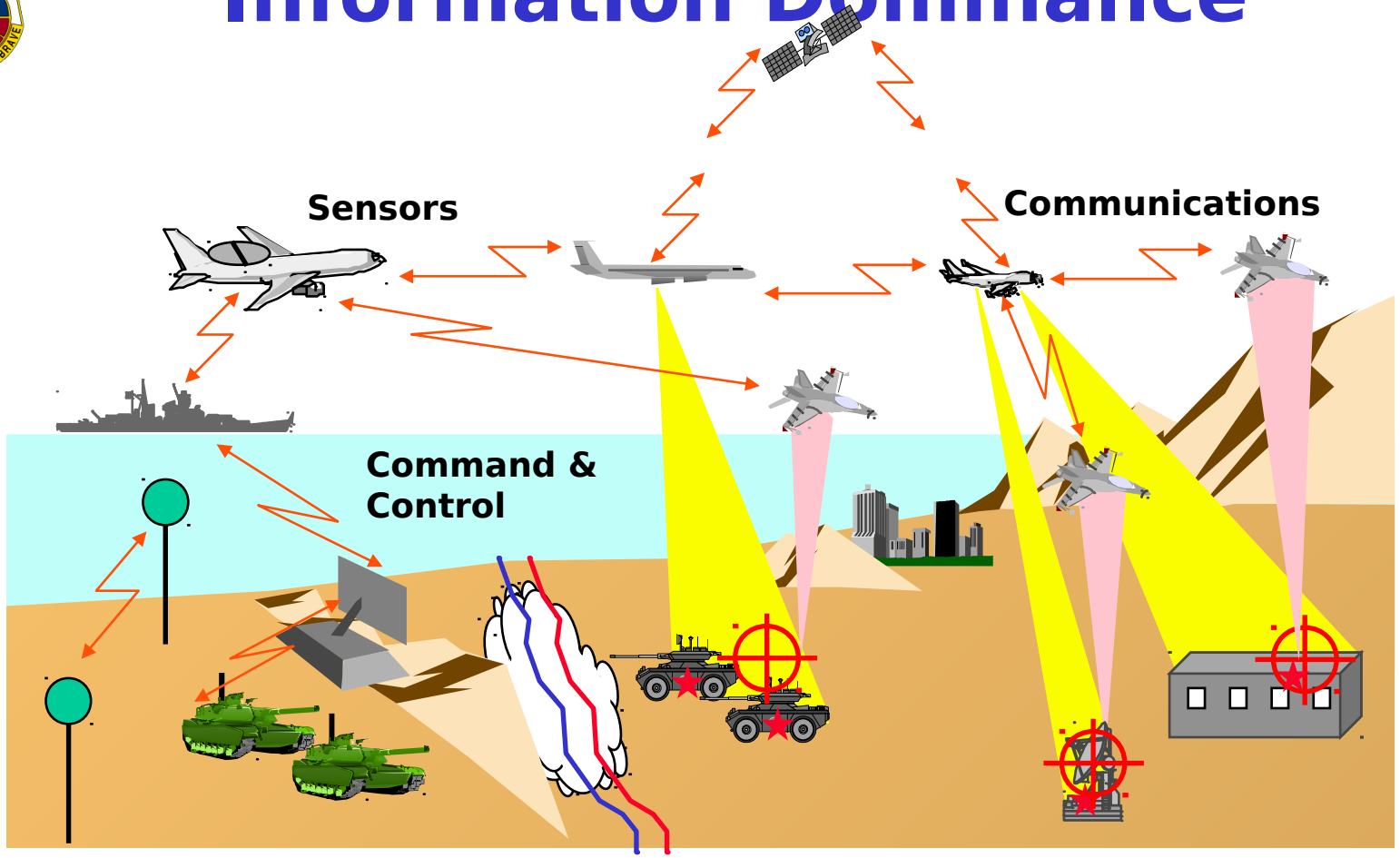
Fuel Compartments

Shock Mount Electrical Boxes

Battle Override of Engine Control

M1A1

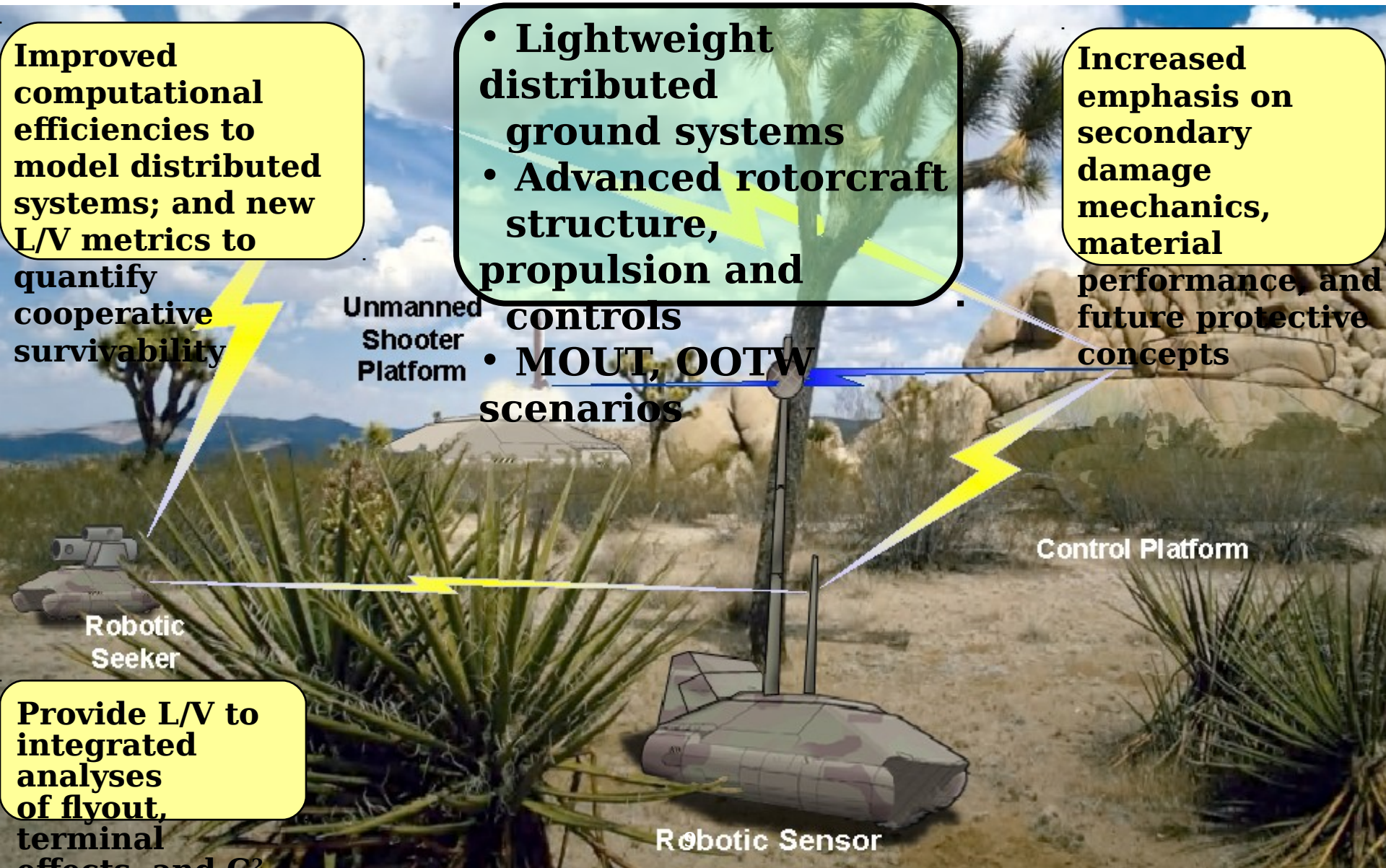
Information Dominance



Info. Dominance $\frac{\text{Blue Knowledge}}{\text{Red Knowledge}}$

Information Dominance is essential to survivability and lethality of the transformed force

Cooperative Survivability



Improved computational efficiencies to model distributed systems; and new L/V metrics to quantify cooperative survivability

- Lightweight distributed ground systems
- Advanced rotorcraft structure, propulsion and controls
- MOUT, OOTW scenarios

Increased emphasis on secondary damage mechanics, material performance, and future protective concepts

Provide L/V to integrated analyses of flyout, terminal effects, and C²

ARL/SLAD's Challenges in Supporting Army Transformation

Future Exploding Workload

Reduced Resources

High Priority Current Needs

Phase 0 Concept Exploration & Definition	Phase I Program Definition & Risk Reduction	Phase II Engineering & Manufacturing Development	Phase III Production, Fielding/Deployment, & Operational Support
MS 0	MS I	MS II	MS III

Lighter Systems

Compressed Schedule

Participate in Integrated Concept, and Integrated Product Teams

- Model concept vehicles.
- Support technology selections.
- Provide survivability & lethality design recommendations.

- Finalize system model.
- Provide Live Fire Test predictions.
- Support system evaluations.

- Model proposed product improvements.
- Quantify PIP effects on system survivability & lethality.

Digitization/ IO challenges

Traditional Survivability Analysis

Asymmetric Threats

ARL/SLAD's Challenges in Supporting Army Transformation

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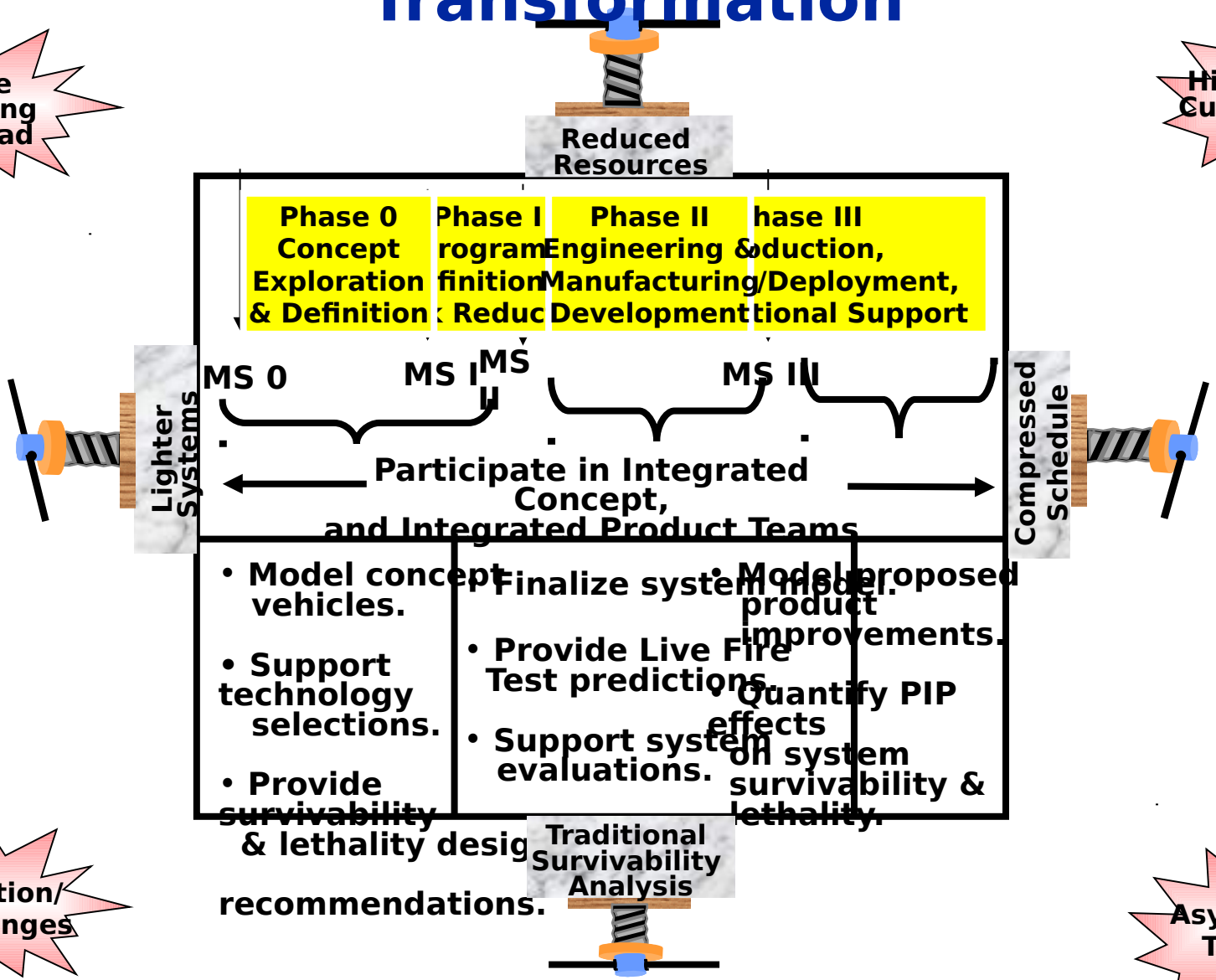
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